AD/A-003 817

ENGINEERING DESIGN HANDBOOK. EXPLOSIONS IN AIR. PART ONE

Army Materiel Command
Alexandria, Virginia

15 July 1974

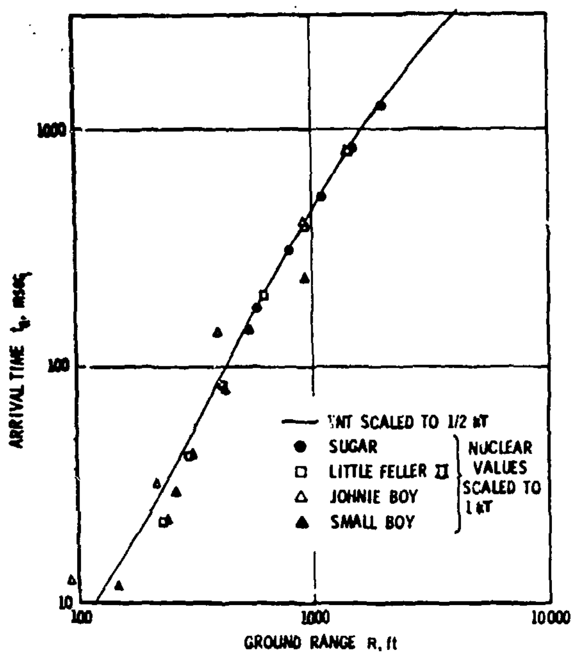

Figure 5-10. Scaled Arrival Time vs Ground Range[7]

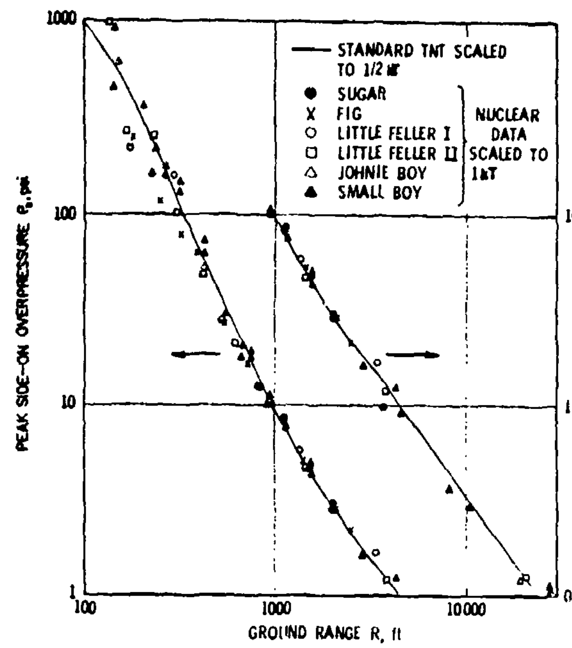

Figure 5-11. Scaled Peak Overpressure vs Ground Range[7]

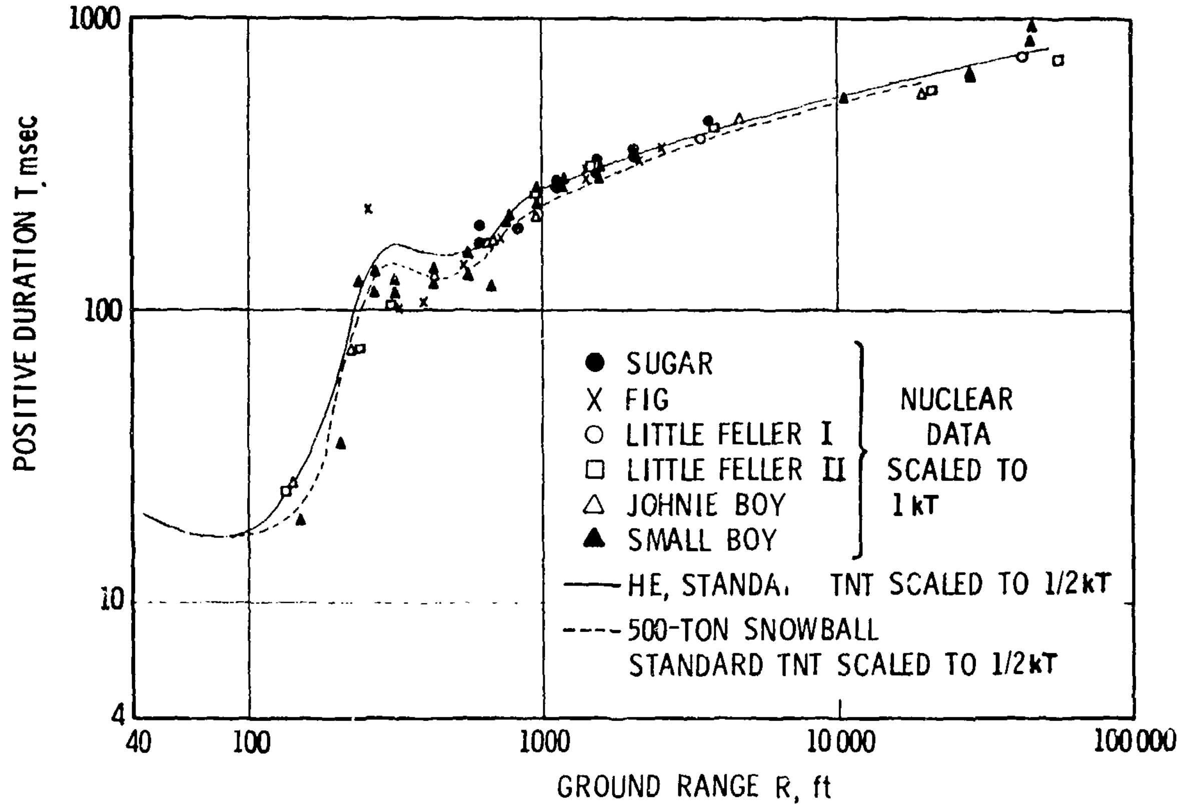

Figure 5-12. Scaled Positive Duration vs Ground Range[7]

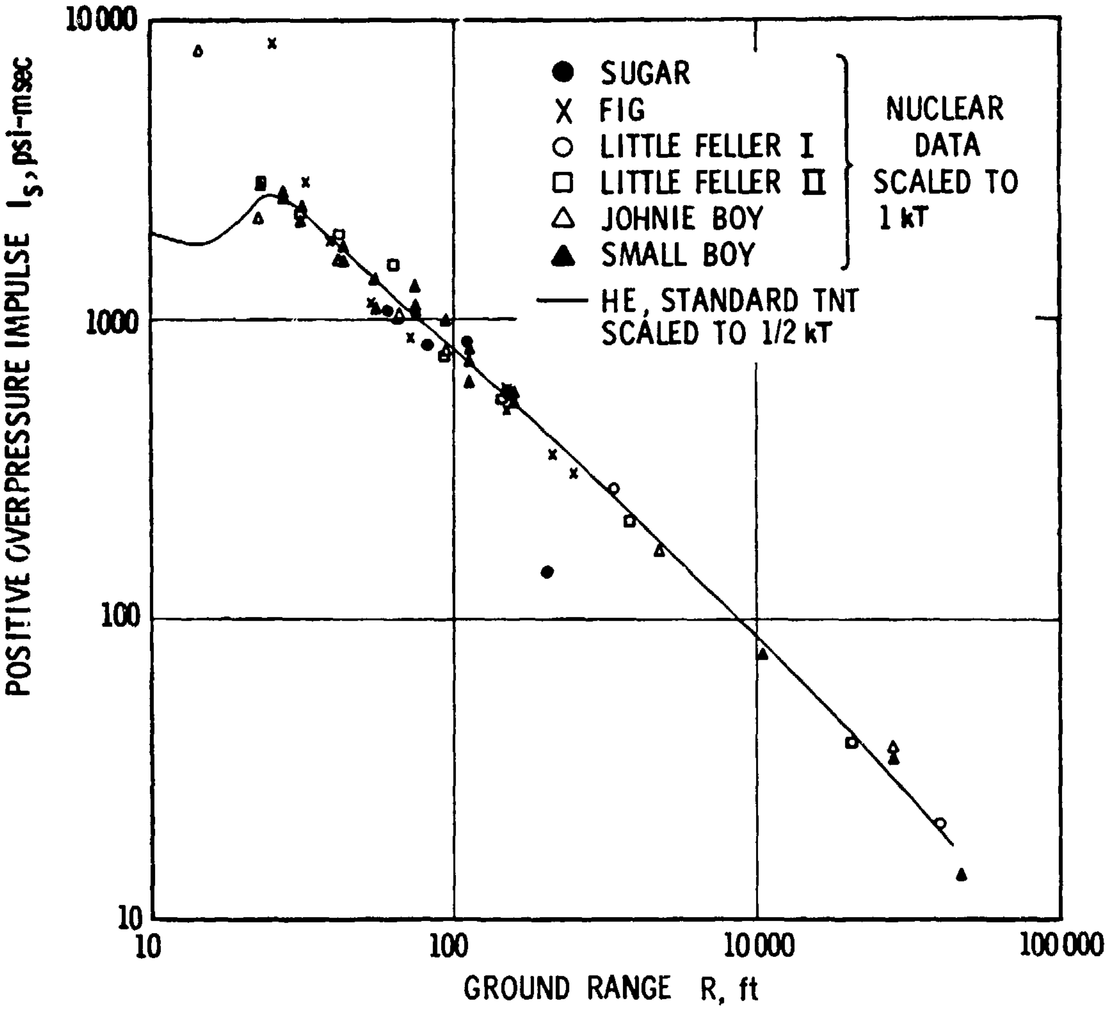

Figure 5-13. Scaled Positive Overpressure Impulse vs Ground Range[7]

many of the Canadian experiments. (These tests were also the first to demonstrate the "wavy" shape of the curves of scaled impulse and scaled duration at relatively small scaled distances.) These include time histories of particle velocity and density. John M. Dewey[11] reports data foı particle velocity for a range of TNT charges from 30 to 200,000 lb. Typical data from Ref. 11 taken from high speed motion pıcture photography of smoke trails displaced by flow behind the shock front, are shown in Figs. 5-14 through 5-16. Dewey has also made an empirical fit (see Eq. 1-10, Ref. 11) to an equation for time history of decay of velocity in a blast wave. (Dewey's parameter S is proportional to $(W/\rho_0)^{1/3}$.) Anson and Dewey[12] also report some measurements of time history of density, but they are insufficient in number to establish the variation of this parameter with scaled distance. The final set of large-scale ground-burst tests which we will note here were conducted at Nevada Proving Ground with 20-ton spherical TNT charges half-buried in the ground[13]. The purpose of these tests (Code name Flat Top I, II and III) was to obtain airblast data in the high overpressure region of 10 to 10,000 psi, and to compare with previous data from the Canadian tests. Three tests were conducted and data collected on arrival times, side-on overpressures and impulses, and dynamic pressures. Overpressures were slightly lower than predicted for $P_s > 10$ psi, presumably because the charge was half-buried. In the same range, durations were lc.ıger than predicted. Typical plots of data

5. M. Lutzky, *Theoretical Versus Experimental Results for Air Blast from One-Pound Spherical TNT and Pentolite Charges at Sea Level Conditions*, NOLR 65-57, July 1965. AD-619 438.

6. E. J. Bryant, N. H. Ethridge, and J. H. Keefer, *Measurements of Air-Blast Phenomena with Self-Recording Gages*, WT-1155, Feb.-May 1955, AD-617 170.

7. C. N. Kingery, *Parametric Analysis of Sub-Kiloton Nuclear and High Explosive Air Blast*, BRL Report No. 1393, Feb. 1968, AD-833 698.

8. N. A. Haskell, J. A. Fava, and R. M. Brubaker, *Measurement of Free Air Atomic Blast Pressures*, WT-1101, Operation TEAPOT-Project 1.1, Headquarters Field Command, Armed Forces Special Weapons Project, Sandia Base, Albuquerque, New Mexico, Feb. 1958, AD-460 280.

9. C. N. Kingery, *Air Blast Parameters Versus Distance for Hemispherical TNT Surface Bursts*, BRL Report No. 1344, Sept. 1966.

10. R. E. Reisler, J. H. Keefer, and L. Giglio-Tos, *Basic Air Blast Measurements from a 500-ton TNT Detonation Project 1.1 Operation Snowball*, BRL Memorandum Report No. 1818, Dec. 1966.

11. J. M. Dewey, "The Air Velocity in Blast Waves from TNT Explosions", *Proc. of the Royal Soc.*, A, 279, pp. 366-385 (1964).

12. W. A. Anson and J. M. Dewey, *Density Measurements in the Blast Wave from a Surface Burst 500-ton TNT Hemispherical Charge*, Suffield Technical Paper No. 305, S.E.S., Ralston, Alberta, Canada, Aug. 1965.

13. R. E. Reisler, L. Giglio-Tos, and R. C. Kellner, *Ferris Wheel Series, Flat Top Event, Project Officers Report - Project 1.1, Airblast Phenomena*, POR-3001, Oct. 1966, AD-801 665.

14. E. J. Bryant, R. A. Eberhard, and C. N. Kingery, *Mach Reflection Over Hard Packed Dirt and Dry Sand*, BRL Report No. 809, July 1952.

15. S. D. Schleuter, R. G. Hippensteel, and B. F. Armendt, *Measurements of Air Blast Parameters Above a Reflecting Surface*, BRL Memorandum Report No. 1645, April 1965.

16. A. J. Hoffman and S. N. Mills, Jr., *Air Blast Measurements About Explosive Charges at Side-On and Normal Incidence*, BRL Report No. 988, July 1956.

17. O. T. Johnson, J. D. Patterson, II, and W. C. Olson, *A Simple Mechanical Method for Measuring the Reflected Impulse of Air Blast Waves*, BRL Memorandum Report No. 1088, July 1957, (also, *Proc. of 3rd U. S. Nat. Cong. of Appl. Mech.*, ASME, New York, pp. 203-207, June 1958).

18. W. Olson and J. Wenig, *A Double-Charge Technique to Measure Face-On Blast*, BRL Memorandum Report No. 1347, May 1966.

19. W. H. Jack, Jr., *Measurements of Normally Reflected Shock Waves from Explosive Charges*, BRL Memorandum Report No. 1499, July 1963, AD-422 866.

20. R. G. Sachs, *The Dependence of Blast on Ambient Pressure and Temperature*, BRL Report No. 466, May 1944.

21. J. Dewey and J. Sperrazza, *The Effect of Atmospheric Pressure and Temperature on Air Shock*, BRL Report No. 721, May 1950.

22. W. C. Olson, J. D. Patterson II, and J. S. Williams, *The Effect of Atmospheric Pressure on the Reflected Impulse from Air Blast Waves*, BRL Memorandum Report No. 1241, Jan. 1960.